

**REMARKS**

Claims 58 and 63 has been amended to clarify the subject matter of the claimed invention and to further differentiate over the cited prior art. Support may be found throughout the Specification, for example, page 17 of the Specification. No new matter has been added.

The art rejections are respectfully traversed. Considering first the rejection of claims 2, 3, 15, 17, 19-21, 24-26 and 58-61 63-65 and 70-76 under § 103(a) as being obvious from da Costa in view of Chinn, independent claims 58 and 63 each requires, in part, a pump including an actuator housing having a chamber housing a liquid, and successive actuators in a series that are sequentially expanded from the starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port . The combination of Chinn and da Costa does not teach this. Da Costa teaches a hermetically sealed refrigeration system compressor using a piezoelectric material as pistons to move and compress a gas. Abstract. Successive pistons in da Costa provide a smaller volume in which the fluid may be present. Col. 3, line 53-59. It is well know by those having skill in the art that liquids may not be compressed. Therefore, the compressor of da Costa will not function when housing a liquid. Accordingly, da Costa does not provide at least this feature of the claims.

Moreover, the pump of da Costa may not be combined with the teachings of Chinn, or any other piece of art providing a housing that maintains a constant volume, to provide a pump that advances the flow of liquid through the chamber and out the outlet port as required by the claims. Da Costa has a stated intended purpose of being used as a compressor for refrigeration systems. Title, Abstract. Substituting a series of actuators that creates a housing with an equal volume for the decreasing volume of da Costa having an equal volume would make the invention of da Costa completely inoperable for its intended purpose.

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Indeed, any combination of da Costa and Chinn would make the invention of da Costa inoperable for its intended purpose. The Examiner, in the Office Action dated July 1, 2009, cites Chinn for teaching the use of an elastomeric material as a valve actuator, and submits that Chinn and da Costa may be combined to achieve the present invention by substituting the structure of Chinn for each individual actuator of da Costa. The Examiner has used improper hindsight to cherry pick the teachings of da Costa and Chinn in order to find the elements of the claims. Specifically, the Examiner states:

Chinn et al discloses an actuator, which may be used as a pump (col. 2 line 2) and includes an electro-actuated polymer gel housed in a non-conductive housing. The gel 10 is encased in a housing 20 which is chemically inert, the gel is encased within the housing by a member 24 which is semi-permeable to the electrolyte. This structure is also encased with a sealed conformal coating. Note especially the disclosure from col. 5 line 55 to col. 6 line 36. At the time of the invention it would have been obvious to one of ordinary skill in the art to substitute the plural actuators such as taught by Chinn et al for the actuators of da Costa since such a substitution would result in a miniature fluid device that is actuated with low electrical potentials and has significant performance characteristics (see col. 1 lines 30-35 and col. 2 lines 17-28). Final Rejection dated July 1, 2009 at p. 3

The Examiner misconstrues the teachings of da Costa and Chinn et al. in order to substitute the actuators as taught by Chinn et al. for the actuators of da Costa. Da Costa describes a “hermetic compressor to be used in refrigeration systems, such as refrigerators, freezers, air conditions and others which **require high pressure pumping.**” Abstract (emphasis added).

High pressure changes and volume of fluid displaced are required in refrigeration compressors to allow the temperature change of the refrigeration fluid that drives the cooling action of the refrigerator. In compressor refrigeration units, a refrigerant gas (at or slightly above the temperature of the refrigerator volume) is compressed in a compressor. The pressure change in the compressor heats the gas and causes the refrigerant to condense into a liquid.

When the high pressure condensed refrigerant is discharged from the compressor the refrigerant

expands and evaporates. The cooling of the expanding and evaporating refrigerant is used to cool the refrigerated volume. Because condensation occurs at lower pressures when the gas is at a lower initial temperature, the pressure needed to condense the refrigerant is lowest at extremely low temperatures. See US 2007/0068181 ¶¶ 1-15 (describing known refrigerator systems, filed Oct. 29, 2003)

While no specific pressure is taught by da Costa, U.S. patent no. 4,515,534 to Lawless et al. ("Lawless"), cited during prosecution of da Costa describes a miniature solid state gas compressor with a 25 atm (2,532.5 kpa) outlet pressure as typical for use in refrigeration. col. 11, lines 6-25. Lawless further describes flow rates of 261 mg/sec of air operating at 1khz or one thousand pulses of the pump per second. See col. 10, lines 7-40. Moreover, U.S. Patent No. 7,207,191 to Zhu et al. (filed Mar. 29, 2004) describes pressures typical in a cryogenic refrigerator stating, "depending on the refrigerant, the pressure may be ranged from 0.1 Mpa – 1000 Mpa" (100 – 1,000,000 kpa). Col. 6, line 66-col. 7, line 3. Thus, even at extremely low temperatures (2-30 degrees K), the pressure required by a refrigeration compressor is at an absolute minimum 100 kpa.

In contrast, the actuators of Chinn "display a 90 second lag time before the specimen begins to swell axially" and reach a maximum pressure of about 14 kPa after about 20 minutes of oxidation. Col. 4, lines 11-37 and Fig. 2. An arrangement of the structure of Chinn in series in place of the actuators of da Costa, as suggested by the Examiner, would take several hours to perform a single stroke reaching a pressure less than 1/100<sup>th</sup> of the pressures typically used in refrigeration compressors and a fraction of the minimum required even at extremely cold temperatures. Such limited compression capability over such a long period of time would be completely incapable of cooling even minute volumes in the refrigeration context.

Additionally, the times and pressures reflected in Chinn take place at temperatures between 19-22°C (approximately room temperature). See Fig. 2. One having skill in the art would expect even lower pressure exerted due to slower uptake of solvent and ions, and even freezing of the solvent and actuator gel, at the lower temperatures required in refrigeration.

In short, replacing the actuators of da Costa with the actuators of Chinn would make the invention of da Costa completely inoperable for its intended purpose. It is well established that "an inoperable invention or one which fails to achieve its intended result does not negative novelty." *U.S. v. Adams*, 383 U.S. 39, 50, (1966) (citing *Smith v. Snow*, 294 U.S. 1, 17 (1935)). The Examiner provides no rationale by which Chinn might be otherwise modified to achieve the claimed invention. Accordingly, because one having skill in the art would have no expectation of success in combining the teachings of Chinn and da Costa, the rejection under 35 U.S.C. § 103 (a) is improper and must be withdrawn.

Claims 2, 3, 15, 17, 19-21, 24-26 and 59-61, depend upon independent claim 63, and are thus allowable for the reasons stated above, as well as for their own, additional, limitations.

Turning to the rejection of claims 5-7 and 65-69 as being unpatentable over da Costa in view of Chinn et al. as applied to claim 59 above and further in view of Culp (U.S. Patent No. 5,192,197), the deficiencies of da Costa in view of Chinn is set forth above. Culp is cited for teaching an activator including a controller which is responsive to pressure, temperature, and flow signals from a sensor. Final Rejection at p. 3. Culp does nothing to provide the more basic teachings missing from da Costa and Chinn as described above. Accordingly, claims 5-7 and 65-69 are allowable at least for the reasons adduced above, as well as for their own, additional limitations.

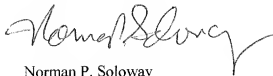
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Having dealt with all the objections raised by the Examiner, the Application is believed to be in order for allowance. Entry of the foregoing Amendment and allowance of the Application are respectfully requested.

In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391

Respectfully submitted,



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I hereby certify that this correspondence is being deposited with the United States Patent Office via the electronic filing procedure on September 27, 2010.

By 

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